

REMARKS

The Office Action dated September 3, 2008, has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

By this Response, claims 21, 32, 38, and 40-42 have been amended to more particularly point out and distinctly claim the subject matter of the present invention. Claims 43-45 were cancelled without prejudice or disclaimer. Claims 1-20, 22, 29, 34-35, and 39 were previously cancelled without prejudice or disclaimer. No new matter has been added. Support for the above amendments is provided in the Specification at least on page 12, line 3, to page 18, line 17. Accordingly, claims 21, 23-28, 30-33, 36-38, 40-42, and 46-47 are currently pending in the application, of which claims 21, 32, and 38 are independent claims.

In view of the above amendments and the following remarks, Applicants respectfully request reconsideration and timely withdrawal of the pending rejections to the claims for the reasons discussed below.

Drawing Objection under 37 C.F.R. §1.84(p)(4)

The Office Action objected to the drawings under 37 C.F.R. §1.83(a) because reference characters “88” and “56” have both been used to designate a prefilter (feedforward filter).

Accordingly, Applicants have amended the Specification beginning at page 15, line 7, and beginning at page 17, line 1, clarifying that reference character “56” designates the prefilter (feedforward filter), rendering the objections to the drawings under 37 C.F.R. §1.83(a) moot.

Therefore, Applicants respectfully request withdrawal of the objections to the drawings under 37 C.F.R. §1.83(a) and respectfully submit that the drawings are in condition for issuance.

Drawing Objection under 37 C.F.R. §1.84(p)(5)

The Office Action objected to the drawings under 37 C.F.R. §1.84(p)(5) because the drawings do not include the reference character, “88” mentioned in the description.

As previously noted above, Applicants have amended the Specification beginning at page 15, line 7, and beginning at page 17, line 1, clarifying that reference character “56” designates the prefilter (feedforward filter). Accordingly, reference character, “88” has been removed from the disclosure of the Specification, rendering the objections to the drawings under 37 C.F.R. §1.84(p)(5) moot.

Therefore, Applicants respectfully request withdrawal of the objections to the drawings under 37 C.F.R. §1.84(p)(5) and respectfully submit that the drawings are in condition for issuance.

Drawing Objection under 37 C.F.R. §1.83(a)

The Office Action objected to the drawings under 37 C.F.R. §1.83(a) because they allegedly fail to show a signal connection between the signal filter and the “joint optimizer,” as described in the Specification. Applicants respectfully traverse these drawing objections for at least the following reasons.

Applicants respectfully submit that Figure 3, line 82, illustrates the signal connection between prefilter 56 and joint optimizer 72. Line 82 further illustrates a connection between joint optimizer 74 to prefilter 56 upon which optimal parameter values calculated at a processing element are provided (See Specification at least on page 13, lines 1-8).

Accordingly, Applicants respectfully submit that the drawings sufficiently illustrate a signal connection between the signal filter and the joint optimizer, as described in the Specification.

Therefore, Applicants respectfully request withdrawal of the objections to the drawings under 37 C.F.R. §1.83(a) and respectfully submit that the drawings are in condition for issuance.

Specification

The Office Action objected to the disclosure of the Specification because the limitation, “direct” on page 11, line 9, should be replaced with “decision.”

Accordingly, Applicants have amended the Specification at page 11, line 9, to replace “direct” with “decision,” rendering the objection to the disclosure of the Specification moot.

Therefore, Applicants respectfully request withdrawal of the objections to the disclosure of the Specification, and respectfully submit that the disclosure of the Specification is in condition for issuance.

Claim Objections

The Office Action objected to claims 21, 23-28, 30-33, 36-38, and 40-47 because of minor informalities. The Office Action alleged that claim 21 recites that the DFSE includes a prefilter (feed forward filter), which is allegedly inconsistent with the teachings in the Specification at page 11, lines 8-11, that describes the prefilter being independent of the DFSE.

Accordingly, Applicants have amended claims 21, 32, and 38 to more particularly point out and distinctly claim the subject matter of the present invention, rendering the objection to claims 21, 23-28, 30-33, 36-38, 40-42, and 46-47 moot. Claims 43-45 have been cancelled without prejudice or disclaimer.

Therefore, Applicants respectfully request withdrawal of the objections of claims 21, 23-28, 30-33, 36-38, 40-42, and 46-47, and respectfully submit that claims 21, 32, and 38, and the claims that depend therefrom, are now in condition for allowance.

Claim Rejections under 35 U.S.C. §112, First Paragraph

The Office Action rejected claims 43-45 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. Specifically, the Office Action alleged that the claims contain subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

Accordingly, Applicants have cancelled claims 43-45 without prejudice or disclaimer, rendering the rejection of claims 43-45 under 35 U.S.C. §112, first paragraph moot.

Therefore, Applicants respectfully request withdrawal of the rejections of claims 43-45 under 35 U.S.C. §112, first paragraph.

Claim Rejections under 35 U.S.C. §112, Second Paragraph

The Office Action rejected claims 38 and 40-42 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Office Action alleged that the limitation, “means” is not preceded by a function; therefore, the Office Action alleged that it is impossible to determine the equivalents of the element, as required by 35 U.S.C. §112, sixth paragraph.

Accordingly, Applicants have amended claims 38 and 40-42 to recite means-plus-function limitations for the recited apparatus, rendering the rejections of claims 38 and 40-42 under 35 U.S.C. §112, second paragraph, moot.

Furthermore, the Office Action rejected claims 21, 23-28, 30, and 31 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically, the Office Action alleged that claim 21 recites, “a prefilter, a summing element, a feedback filter and a maximum likelihood sequence estimator” without the necessary connection between the components to form the DFSE.

Accordingly, Applicants have amended claim 21 to recite a connection between the components of the DFSE and the prefilter for the claimed apparatus, rendering the rejections of claims 21, 23-28, 30, and 31 under 35 U.S.C. §112, second paragraph, moot.

Therefore, Applicants respectfully request withdrawal of the rejections of claims 21, 23-28, 30-31, 38, and 40-42 under 35 U.S.C. §112, second paragraph, and respectfully submit that claims 21 and 38, and the claims that depend therefrom, are now in condition for allowance.

Claim Rejections under 35 U.S.C. §102(e)

The Office Action rejected claims 21, 23-26, 28, 30, 38, 40-42, and 46-47 under 35 U.S.C. §102(e) as allegedly anticipated by Zangi, *et al.* (U.S. Patent No. 6,775,322) (“Zangi”). The Office alleged that Zangi discloses or suggests every feature recited in

claims 21, 23-26, 28, 30, 38, 40-42, and 46-47. Applicants respectfully submit that the claims recite subject matter that is neither disclosed nor suggested in Zangi.

Claim 21, upon which claims 23-28, 30-31, and 46-47 depend, recites an apparatus. The apparatus includes a signal filter configured to filter a signal from a signal receiver, and a signal estimator configured to estimate channel operations of the signal from the signal filter. The apparatus also includes a signal optimizer configured to generate optimized values for the signal from the signal filter, a prefilter configured to filter the signal from the signal filter using the generated optimized values for the signal, and a decision feedback sequence estimator configured to receive the generated optimized values. The decision feedback sequence estimator includes a summing element, a feedback filter, and a maximum likelihood sequence estimator. The summing element, the feedback filter, and the maximum likelihood sequence estimator are operatively connected to one another and further operatively connected to the prefilter. An interconnection of the prefilter, the feedback filter, the maximum likelihood sequence estimator, and the summing element is configured to permit concurrent interference and prefilter operations to be performed.

Claim 38, upon which claims 40-42 depend, recites an apparatus. The apparatus includes signal filtering means for filtering a signal from a signal receiver, and signal estimating means for estimating channel operations of the signal from the signal filter means. The apparatus also includes signal optimizing means for generating optimized values for the signal from the signal filtering means, prefiltering means for filtering the

signal from the signal filtering means using the generated optimized values for the signal and interference cancelling means for receiving the generated optimized values to perform concurrent interference and prefilter operations. The interference cancelling means includes prefiltering means, summing means for summing inputs from the prefilter means, feedback filtering means for filtering optimized values and a summed output from the signal optimizing means and the summing means, respectively, and maximum likelihood sequence estimating means for generating maximum-likelihood values from the summing means. An interconnection of the prefiltering means, the feedback filtering means, the maximum likelihood sequence estimating means, and the summing means is configured to permit the concurrent interference and prefilter operations to be performed.

As will be discussed below, Zangi fails to disclose or suggest every feature recited in claims 21, 23-26, 28, 30, 38, 40-42, and 46-47, and therefore fails to provide the features of the claims discussed above.

Zangi is directed to a method for computing a coefficient of a finite impulse response pre-filter applied prior to a decision algorithm in an equalizer having adjustable filter coefficients. Computations performed to compute the filter coefficients for a right half burst may be used to compute the prefilter for a left hand burst, reducing the number of computations. A square root-free algorithm may be used to solve the system of linear equations, reducing computational complexity (Zangi, Abstract; col. 2, lines 8-39).

Applicants respectfully submit that Zangi fails to disclose or suggest each and every element recited in claim 21, and similarly recited in claim 38. Specifically, Zangi

fails to disclose or suggest, at least, “a decision feedback sequence estimator configured to receive the generated optimized values, wherein the decision feedback sequence estimator comprises a summing element, a feedback filter, and a maximum likelihood sequence estimator” as recited in claim 21 (emphasis added), and similarly recited in claim 38.

Rather, Zangi discloses equalizer 100, which may be a decision feedback equalizer (DFE) or a decision feedback sequence estimation (DFSE) equalizer. Equalizer 100 includes an equalization filter 101, a decision algorithm 108, and a processor 120. Equalization filter 101 includes a prefilter 102, feedback filter 104, and a summer 106. Processor 120 includes channel estimator 122 and adaptive algorithm 124 (Zangi, Figures 1 and 3; col. 3, line 29, to col. 4, line 60).

The Office Action alleged that Zangi discloses that circuits 101 (equalization filter 101) and 108 (decision algorithm 108) together describe the decision feedback estimator which includes prefilter 102, feedback filter 104, and summing device 106. The Office Action further asserted that the estimator 122 (channel estimator) and circuit 124 (adaptive algorithm) teach the features for the signal estimator and the signal optimizer, respectively, recited in claim 21, and similarly recited in claim 38 (See Office Action on pages 2-3). Applicants respectfully disagree with the Office Action’s assertions.

Further, the Office Action alleged Figure 4 illustrates that the DFSE circuit (*i.e.*, circuits 101 and 108, as defined in the Office Action) can be independently provided from circuit 124 (*i.e.*, defined as the optimizer in the Office Action) and the signal

estimator 122. The Office Action further alleged that there are no structural differences between providing the estimator and the optimizer inside or outside of the DFSE. As long as the overall circuit structure remains the same no matter how one chooses to group the circuit components in the figures using dotted lines and/or name them, the circuit functionality of drawing figures will remain unchanged (See *Response to Arguments* on page 13 of the Office Action). Applicants respectfully disagree with the Office Action's assertions.

As previously noted above, Applicants respectfully submit that the teachings of Zangi clearly describe both adaptive algorithm 124 and channel estimator 122 being a part of processor 120 of DFE/DFSE equalizer 100. Channel estimator 122 estimates the impulse response of the communication channel and adaptive algorithm 124 computes filter coefficients of pre-filter 102 and feedback filter 104 *within DFE/DFSE equalizer 100*. Accordingly, Zangi discloses generating optimized values *within DFE/DFSE equalizer 100*; and therefore, DFE/DFSE equalizer 100 is not configured to receive the generated optimized values.

Furthermore, Applicants respectfully disagree with the Office Action's allegations that Figure 4 illustrates that DFE/DFSE equalizer 100 can be independently provided from adaptive algorithm 124. Rather, Figure 4 illustrates another model of the digital communication system 10, whereby the structural elements *within DFE/DFSE equalizer 100*, filter 24 (*i.e.*, prefilter 102), feedback filter 104, summer 106, and decision algorithm 108 are further described for computing coefficients of a finite impulse response pre-filter

applied prior to a decision algorithm in DFE/DFSE equalizer 100 (Zangi, col. 5, line 29, to col. 8, line 49).

Applicants respectfully submit that is improper for the Office Action to alter the teachings of Zangi to allege that adaptive algorithm 124 is a separate structural element located outside DFE/DFSE equalizer 100, when the teachings of Zangi clearly describe that DFE/DFSE equalizer 100 *includes* processor 120 having both adaptive algorithm 124 and channel estimator 122.

Furthermore, Applicants respectfully submit that the Office Action failed to examine each and every structural element recited in claims 21 and 38 per the requirements of MPEP §2114. MPEP §2114 states, in part, that “even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is any structural difference.” *In re Ruskin*, 347 F.2d 843, 146 USPQ 211 (CCPA 1965) as implicitly modified by *In re Donaldson*, 16 F.3d 1189, 29 USPQ2d 1845 (Fed. Cir. 1994). See also *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999) (The claims were drawn to a disposable diaper having three fastening elements. The reference disclosed two fastening elements that could perform the same function as the three fastening elements in the claims. The court construed the claims to require three separate elements and held that the reference did not disclose a separate third fastening element, either expressly or inherently.).

The Office Action alleged that “as long as the overall circuit structure remains the same no matter how one chooses to group the circuit components in the figures using

dotted lines and/or name them, *the circuit functionality of drawing figures will remain unchanged*” (See Office Action on page 13). Accordingly, the Office Action’s rejections are based on the *functionality* of the structural elements described in the system of Zangi, whereby the structural elements described in the system are re-arranged or re-defined to allege that Zangi discloses or suggests the features recited in claims 21 and 38.

Accordingly, Zangi fails to disclose or suggest, at least, “a decision feedback sequence estimator configured to receive the generated optimized values, wherein the decision feedback sequence estimator comprises a summing element, a feedback filter, and a maximum likelihood sequence estimator,” as recited in claim 21 (emphasis added), and similarly recited in claim 38.

Claims 23-26, 28, 30, and 46-47 depend from claim 21. Claims 40-42 depend from claim 38. Accordingly, claims 23-26, 28, 30, 40-42, and 46-47 should be allowable for at least their dependency upon an allowable base claim, and for the specific limitations recited therein.

Therefore, Applicants respectfully request withdrawal of the rejections of claims 21, 23-26, 28, 30, 38, 40-42, and 46-47 under 35 U.S.C. §103(a) and respectfully submit that claims 21 and 38, and the claims that depend therefrom, are in condition for allowance.

Claim Rejections under 35 U.S.C. §103(a)

Claim 27

The Office Action rejected claim 27 under 35 U.S.C. §103(a) as being allegedly unpatentable over Zangi in view of Taylor (U.S. Publication No. 2002/0197987) (“Taylor”). Applicants respectfully submit that the claims recite subject matter that is neither disclosed nor suggested in the combination of Zangi and Taylor.

Zangi was discussed above. Taylor is directed to a transparent data transmission for a wireless/cellular communication system. An analog signal from a modem or other source is converted at a remote station to a digital bit stream in accordance with a memoryless compaction rule. The resultant bit stream is then transmitted through a transparent channel that includes a wireless cellular-telephone link. At the base station, that bit stream is transmitted over a public-switched-network span (Taylor, Abstract; paragraphs [0003]-[0005]).

As previously noted above, Zangi fails to disclose or suggest each and every element recited in claim 21. Taylor fails to cure the deficiencies of Zangi. Specifically, Taylor fails to disclose or suggest, at least, “a decision feedback sequence estimator configured to receive the generated optimized values, wherein the decision feedback sequence estimator comprises a summing element, a feedback filter, and a maximum likelihood sequence estimator,” as recited in claim 21 (emphasis added). Accordingly, Zangi in view of Taylor fails to disclose or suggest each and every element recited in claim 21.

Claim 27 depends from claim 21. Accordingly, claim 27 should be allowable for at least its dependency upon an allowable base claim, and for the specific limitations recited therein.

Therefore, Applicants respectfully request withdrawal of the rejection of claim 27 under 35 U.S.C. §103(a) and respectfully submit that claim 21, and the claims that depend therefrom, are in condition for allowance.

Claims 31-34, 36, and 43-45

The Office Action rejected claims 31-34, 36, and 43-45 under 35 U.S.C. §103(a) as being allegedly unpatentable as obvious over Zangi in view of Malkemes, *et al.* (U.S. Publication No. 2002/0106040) (“Malkemes”). Applicants respectfully submit that the claims recite subject matter that is neither disclosed nor suggested in the combination of Zangi and Malkemes.

Claim 32 recites a method. The method includes receiving a data vector, forming optimized feed forward filter parameters from the data vector, and forming optimized feedback filter parameters from the data vector. The method further includes transmitting the optimized feed forward filter parameters and the optimized feedback filter parameters to a decision feedback sequence estimator. The decision feedback sequence estimator includes a feedback filter. The method further includes applying the optimized feed forward filter parameters to a feed forward filter to define filter characteristics of the feed forward filter, applying the optimized feedback filter parameters to the feedback filter to

define filter characteristics of the feedback filter, and simultaneously performing interference cancellation and pre-filtering operations on the data vector through operation of the feed forward and feedback filters. Receiving the data vector includes receiving a plurality of data vectors on a corresponding plurality of receiving chains.

As will be discussed below, Zangi in view of Malkemes fails to disclose or suggest each and every element recited in claims 31-34 and 36, and therefore fails to provide the features of the claims discussed above. Claims 43-45 have been cancelled without prejudice or disclaimer.

Zangi was discussed above. Malkemes is directed to a method and apparatus for reducing multipath distortion in a wireless IAN system. A spatial diversity combiner includes a plurality of feed forward equalizers (FFE's), a decision feedback equalizer (DFE), and a tap control circuit. The plurality of FFE's receive spatially diverse replicas of an RF signal and optimally combine them. The DFE provides feedback for tap weight control and optimal equalization of the transmission channel. Symbol error is generated by a slicer circuit or by a maximum likelihood sequence estimation (MLSE) process (Malkemes, Abstract; paragraph [0006]).

As previously noted above, Zangi fails to disclose or suggest each and every element recited in claim 21. Malkemes fails to cure the deficiencies of Zangi. Specifically, Malkemes fails to disclose or suggest, at least, “a decision feedback sequence estimator configured to receive the generated optimized values, wherein the decision feedback sequence estimator comprises a summing element, a feedback filter,

and a maximum likelihood sequence estimator,” as recited in claim 21 (emphasis added). Accordingly, Zangi in view of Malkemes fails to disclose or suggest every feature recited in claim 21.

Furthermore, assuming *arguendo* that the teachings of Zangi could be combined with the teachings of Malkemes, the combination of Zangi and Malkemes would fail to disclose or suggest, at least, “forming optimized feed forward filter parameters from the data vector; forming optimized feedback filter parameters from the data vector; transmitting the optimized feed forward filter parameters and the optimized feedback filter parameters to a decision feedback sequence estimator, wherein the decision feedback sequence estimator comprises a feedback filter,” as recited in claim 32 (emphasis added).

Rather, as noted above for claims 1 and 38, Zangi discloses that both adaptive algorithm 124 and channel estimator 122 are part of processor 120 of DFE/DFSE equalizer 100. Channel estimator 122 estimates the impulse response of the communication channel and adaptive algorithm 124 computes filter coefficients of pre-filter 102 and feedback filter 104 *within DFE/DFSE equalizer 100*. Accordingly, Zangi discloses generating optimized values *within DFE/DFSE equalizer 100*; and therefore, the coefficients computed by adaptive algorithm 124 are not transmitted to DFE/DFSE equalizer 10. Rather, they are generated *within DFE/DFSE equalizer 100*.

For similar reasons discussed above for claims 1 and 38, Applicants respectfully disagree with the Office Action’s allegations that Figure 4 illustrates that DFE/DFSE

equalizer 100 can be independently provided from adaptive algorithm 124. Furthermore, Applicants respectfully submit that it is improper for the Office Action to alter the teachings of Zangi to allege that adaptive algorithm 124 is a separate structural element located outside DFE/DFSE equalizer 100, when the teachings of Zangi clearly describe that DFE/DFSE equalizer 100 *includes* processor 120 having both adaptive algorithm 124 and channel estimator 122; and therefore, clearly describe that the coefficients computed by adaptive algorithm 124 are generated *within DFE/DFSE equalizer 100*.

Therefore, Zangi fails to disclose or suggest, at least, “forming optimized feed forward filter parameters from the data vector; forming optimized feedback filter parameters from the data vector; transmitting the optimized feed forward filter parameters and the optimized feedback filter parameters to a decision feedback sequence estimator, wherein the decision feedback sequence estimator comprises a feed forward filter and a feedback filter,” as recited in claim 32 (emphasis added).

Malkemes fails to cure the deficiencies of Zangi regarding the aforementioned features recited in claim 32. Accordingly, the combination of Zangi and Malkemes would fail to disclose or suggest each and every element recited in claims 21 and 32.

Claims 31 and 46-47 depend from claim 21. Claims 33-34 and 36 depend from claim 32. Accordingly, claims 31, 33-34, 36, and 46-47 should be allowable for at least their dependency upon an allowable base claim, and for the specific limitations recited therein.

Therefore, Applicants respectfully request withdrawal of the rejections of claims 31-34, 36, and 46-47 under 35 U.S.C. §103(a), and respectfully submit that claims 21 and 32, and the claims that depend therefrom, are in condition for allowance.

Claim 37

The Office Action rejected claim 37 under 35 U.S.C. §103(a) as being allegedly unpatentable over Zangi in view of Malkemes, and further in view of Taylor. Applicants respectfully submit that the claims recite subject matter that is neither disclosed nor suggested in the combination of Zangi, Taylor, and Malkemes.

Zangi, Taylor, and Malkemes were discussed above.

As previously noted above, Zangi in view of Malkemes fails to disclose or suggest each and every element recited in claim 32. Taylor fails to cure the deficiencies of Zangi and Malkemes. Specifically, Taylor fails to disclose or suggest, at least, “forming optimized feed forward filter parameters from the data vector; forming optimized feedback filter parameters from the data vector; transmitting the optimized feed forward filter parameters and the optimized feedback filter parameters to a decision feedback sequence estimator, wherein the decision feedback sequence estimator comprises a feedback filter,” as recited in claim 32. Accordingly, Zangi in view of Malkemes, and further in view of Taylor, fails to disclose or suggest each and every element recited in claim 32.

Claim 37 depends from claim 32. Accordingly, claim 37 should be allowable for at least its dependency upon an allowable base claim, and for the specific limitations recited therein.

Therefore, Applicants respectfully request withdrawal of the rejection of claim 37 under 35 U.S.C. §103(a) and respectfully submit that claim 32, and the claims that depend therefrom, are in condition for allowance.

CONCLUSION

In conclusion, Applicants respectfully submit that Zangi, Taylor, and Malkemes, whether taken individually or in combination, fail to disclose or suggest each and every element feature recited in claims 21, 23-28, 30-34, 36-38, 40-42, and 46-47. The distinctions previously noted are more than sufficient to render the claimed invention unanticipated and non-obvious. It is therefore respectfully requested that all of claims 21, 23-28, 30-34, 36-38, 40-42, and 46-47 be allowed, and this present application be passed to issuance.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, Applicants' undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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